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09/893,035	06/27/2001	Hag-ju Cho	5649-874	3421

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EXAMINER

KIELIN, ERIK J

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 09/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/893,035

Applicant(s)

CHO, HAG-JU

Examiner

Erik Kielin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) none is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This action responds to the Amendment filed 3 July 2003 (Paper No. 15).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6 and 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's submitted reference, **KR 2000-25706**, in view of US 6,203,613 B1 (**Gates et al.**).

Regarding claim 1, **KR 2000-25706** discloses the insulation layer **14**, upper **16** and lower **12** electrodes, wherein only the first surface portion (i.e. the exposed portion) of the insulating layer **14** exposed by the upper and lower electrodes is covered with a first metal oxide **22** which serves as a reaction barrier layer to prevent damage to the insulating layer **14** during further processing. The second surface portion (i.e. the unexposed surface portion of the insulating layer in contact with the upper metal layer 16) is not covered by metal oxide and does not overlap the second surface portion. (See Abstract and Fig. 4a.)

KR 2000-25706 also discloses that the metal oxide (Al_2O_3 or TiO_2) may be formed by atomic layer deposition (p. 5, lines 22-24), but it is unclear --in the absence of a translation-- to determine if the method of ALD is explained, such as presently claimed in instant claims 2, 5, and 6.

Gates teaches a method of treating an oxygen-containing insulation layer with a metal precursor reactive with oxygen using ALD to form single or plural layers of metal oxide. (See cols. 7-10.) **Gates**, moreover, says that the ALD method is useful for fabricating gate and capacitor dielectrics and reaction barrier layers (col. 3, lines 20-25) such as the reaction barrier layer **22** in **KR 2000-25706**, used to protect the insulating layer **14** therein, as noted above.

Gates also teaches the specific method steps of ALD deposition including, pulsing metal precursor or diluted metal precursor and then inert carrier (cols. 7-10) and argon as the inert gas is taught at col. 7, line 14.

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use ALD and the ALD conditions in **Gates** for forming the reaction barrier metal oxide layers in **KR 2000-25706**, because **Gates** teaches that the method is good for forming reaction barrier layers in integrated circuits, such as those in **KR 2000-25706**.

Regarding claims 3, 4, and 10, although the conditions of pulse time, flow rates and temperatures are not exactly as instantly claimed, each of these parameter ranges overlaps or is nearby those in **Gates** (cols. 7-10), amounting to a matter of routine optimization. (See MPEP 2144.05.) It would have been obvious for one of ordinary skill in the art, at the time of the invention to optimize the ALD conditions of the **Gates** method to form the reaction barrier layer (i.e. "the first metal oxide") of **KR 2000-25706**, to form the best reaction barrier layer, according to precedent.

Regarding claim 9, it is unclear if **KR 2000-25706** teaches the metal precursors for the ALD of the metal oxide. The claimed metal precursors are taught in **Gates** at least at col. 4, lines 56-64. It would have been obvious for one of ordinary skill in the art, at the time of the invention

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to use the metal precursors of **Gates**, as the metal precursors in **KR 2000-25706** because **Gates** also uses ALD to form aluminum oxide and teaches that the metal precursors are appropriate for aluminum oxide deposition. Moreover, it has been held that the selection of a known material based on its suitability for its intended use is *prima facie* obvious. (See MPEP 2144.07.)

Regarding claims 11 and 12, the insulation layer **14** of **KR 2000-25706** is a ferroelectric capacitor layer.

Regarding claim 13, the encapsulating oxide **18** is taught in **KR 2000-25706**. Also note, because the layers of the first oxide layer **22** in **KR 2000-25706** are built up layer-by-layer since ALD is used, each additional monolayer layer encapsulates the layer before it. Accordingly, the first metal oxide layer and the insulation layer are necessarily encapsulated by a second metal oxide layer, by virtue of the method by which ALD works, even if the encapsulating layer is not considered to be **18**.

3. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over **KR 2000-25706** in view of **Gates** as applied to claims 1 and 2 above, and further in view of US 6,335,240 B1 (**Kim et al.**).

The prior art of **KR 2000-25706** in view of **Gates**, as explained above, discloses each of the claimed features except for thermally treating the integrated circuit device in oxygen.

Kim teaches annealing conditions for ALD deposited metal oxide films using O₂ at a temperature of 150-900 °C with exemplary embodiments at 450 °C, which falls within Applicant's claimed range of 400-600 °C. (See **Kim**, Abstract; col. 8, Table 3).

It would be obvious for one of ordinary skill in the art, at the time of the invention, to use the densification treatment of the metal oxide provided in **Kim** in the method of **KR 2000-25706** in view of **Gates** in order to densify the ALD layer and thereby to provide better reaction barrier layer protection.

Although the time is not as exactly claimed in claim 8, the choice would be a matter of routine optimization with a single variable. One would be motivated to find the time required to densify the thin film in **KR 2000-25706** in view of **Gates** for the specific purpose therein to provide protection to the insulating layer of the capacitor. (See MPEP 2144.05.)

Response to Arguments

4. Applicant's arguments filed 3 July 2003 have been fully considered but they are not persuasive.

Applicant argues,

“The metal oxide 22 shown in the 25706 Publication has portions thereof disposed on an upper surface of the upper electrode 16. In sharp contrast with at least the highlighted recitation of Claim 1, there portions of the metal oxide 22 on the upper surface of the upper electrode 16 overlap a non-exposed portion of the insulating layer 14 at an interface with the upper electrode 16.”

Examiner respectfully disagrees. Merriam-Webster Collegiate Dictionary, 10th edition, defines the term “overlap” to be one of the following “to extend over or past **and** cover a part of,” or “to have something in common” (e.g. a surface); or “to occupy the same area in part: lap over.” (Emphasis added.) Applicant's selected use of the term overlap fails to meet any of the above definitions. The metal oxide 22 of the 25706 publication cannot overlap the **unexposed** portion of the insulation layer of the capacitor because the portion is **unexposed**. In other words the

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unexposed portion is covered by or "overlapped" by the upper metal electrode. Accordingly, the argument presented is not found persuasive.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

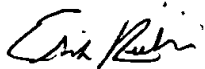
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 703-306-5980. The examiner can normally be reached on 9:00 - 19:30 on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 703-308-4940. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Erik Kielin
Primary Examiner
September 3, 2003